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10/643,895	08/20/2003	Yuji Tochio	1344.1122	4672

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STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
CURS, NATHAN M	
ART UNIT	**PAPER NUMBER**
2613	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/643,895	TOCHIO ET AL.	
	Examiner	Art Unit	
	Nathan Curs	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,8-14,19,21 and 22* is/are rejected.

7)☒ Claim(s) *4-7, 15-18 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 4, 16, 17, 19 and 22 are objected to because of the following informalities:

Claim 4 in line 3 recites "an even digital value"; this should be "an n-digit even digital value". Line 5 recites "an odd digital value"; this should be "an n-digit odd digital value". Line 12 recites "the n-digit digital value"; this should be "the n-digit even or odd digital value". These changes should be made for proper antecedence language.

In claim 16 in line 9 "electrode the pair" should be "electrode of the pair", and in line 11 "electrode a driven state" should be "electrode in a driven state", for proper grammar.

Claim 17, in line 6, "to be" should be removed.

Claim 19, in line 4, "can be" should be changed to "is" and in line 5, "to be" should be removed.

Claim 22, in line 2, recites "a plurality of mirrors"; this should be "a plurality of tilt mirrors" to be consistent with the rest of the claim. In line 3, the claim recites "and first and second mirror arrays"; this should be "and the first and second mirror arrays".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 recites the limitations "said shared configurations" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-3, 8-14, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tochio et al. ("Tochio") (US Patent Application Publication No. 2002/0109076) in view of Berhane et al. ("Berhane") (US Patent Application Publication No. 2002/0171902).

Regarding claim 1, Tochio discloses a control apparatus of an optical signal exchanger which includes a first mirror array and a second mirror array, each having a plurality of tilt mirrors arranged on a plane, each tilt mirror having a reflecting surface at an angle which is controllable, an input optical signal being sequentially reflected by said first and second mirror arrays to output at a specific position (fig. 18 and paragraphs 0135-0137), at which power of an optical signal output at said specific position is detected, and feedback to control an angle of at least one of the reflecting surfaces of the tilt mirrors of said first and second mirror arrays, which have reflected the input optical signal (fig. 19 and paragraphs 0138-148). Tochio's systems is based on MEMS, and Tochio discloses a control signal used for feedback control, and a pair of driving electrodes arranged in a coaxial direction of said tilt mirror (fig. 18), but does not disclose that said control apparatus comprises a resonance component removing section that removes a frequency component corresponding to a mechanical resonance action of changing the angle of any tilt mirror of the first and second mirror array, the frequency component being included in

the control signal used for said feedback control, and said resonance component removing section is shared at least by the pair of driving electrodes. Berhane discloses filtering a control signal for MEMS devices to suppress the mechanical resonance of the MEMS device (paragraphs 0002-0008, 0017, 0018 and 0035-0039). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the filter teaching of Berhane to the mirror driving circuits of Tochio, to provide the advantage of suppressing mechanical resonsance of the MEMS devices, as suggested by Berhane.

Regarding claim 2, the combination of Tochio and Berhane discloses a control apparatus of an optical signal exchanger according to claim 1, comprising: a first mirror drive section that supplies a voltage to either one of a pair of driving electrodes arranged in a first axial direction of a tilt mirror of said first mirror array (Tochio: fig. 18, element 14a, "X AXIS"), and also supplies a voltage to either one of a pair of driving electrodes arranged in a second axial direction different from said first axial direction (Tochio: fig. 18, element 14a, "Y AXIS"), to adjust the angle of the reflecting surface of said tilt mirror of said first mirror array; a second mirror drive section that supplies a voltage to either one of a pair of driving electrodes arranged in a first axial direction of a tilt mirror of said second mirror array (Tochio: fig. 18, element 14b, "X AXIS"), and also supplies a voltage to either one of a pair of driving electrodes arranged in a second direction axial different from said first axial direction (Tochio: fig. 18, element 14b, "Y AXIS"), to adjust the angle of the reflecting surface of said tilt mirror of said second mirror array; an optical power detection section that detects power of the optical signal output from said specific position (Tochio: fig. 18, element 12); and a comparison control section that generates a control signal for controlling a driving state of a controlled tilt mirror from the first mirror array or the second mirror array (Tochio: fig. 18, element 13), so that an angular displacement of the reflecting surface of said controlled tilt mirror is corrected according to the optical power

detected by said optical power detection section (Tochio: paragraphs 0135-0137), wherein said resonance component removing section includes: a first resonance component removing section that removes said resonance frequency component included in the control signal sent from said comparison control section to said first mirror drive section, by using a band-elimination filter that is shared at least for the first axial direction and the second axial direction of a controlled tilt mirror from the first mirror array and a second resonance component removing section that removes said resonance frequency component included in the control signal sent from said comparison control section to said second mirror drive section, by using a band-elimination filter that is shared at least for each of the first axial direction and the second axial direction of a controlled tilt mirror from the second mirror array (Tochio: fig. 19 and Berhane: paragraphs 0006 and 0035-0039, as applicable in the combination, where the resonance eliminating effect of the Berhane-type filter makes it effectively a notch filter or band-elimination filter).

Regarding claim 3, the combination of Tochio and Berhance discloses a control apparatus of an optical signal exchanger according to claim 2, wherein said optical power detection section outputs an analog signal indicating the detected power of the optical signal output to said comparison control section (Tochio: fig. 19, element 12), said comparison control section converts the analog signal from said optical power detection section into a digital signal, and then, according to said digital signal, outputs the control signal for controlling the driving state of the controlled tilt mirror as a digital signal (Tochio: fig. 19, element 13), to said first and second resonance component removing sections, so that an angular displacement of the reflecting surface of said controlled tilt mirror is corrected, and said band-elimination filter of each of said first and second resonance component removing sections which removes said

resonance frequency component included in the control signal from said comparison control section is a digital filter (Berhane: paragraph 0006, as applicable in the combination).

Regarding claim 8, the combination of Tochio and Berhane discloses a control apparatus of an optical signal exchanger according to claim 2, wherein said said first resonance component removing section removes said resonance frequency component included in the control signal received from said comparison control section to control said first mirror drive section, and said second resonance component removing section removes said resonance frequency component included in the control signal received from said comparison control section to control said second mirror drive section. The combination as applied to claim 2 does not disclose that said first resonance removing section uses a band-elimination filter that is shared corresponding to all tilt mirrors on said first mirror array or that said second resonance removing section uses a band-elimination filter that is shared corresponding to all tilt mirrors on said second mirror array. However, Tochio discloses an array of MEMS mirrors (paragraphs 0136), which suggests that the array is made of up multiple of the same type of mirror and Berhane discloses that the purpose of the filter is to remove a resonance corresponding to the mechanical device (paragraph 0006). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that the filter could be shared for the control signals for all the mirrors, since the resonance is a characteristic of the mechanical MEMS mirror device and since the resonance for each mirror in an array of alike MEMS mirrors will be essentially the same as the others.

Regarding claim 9, the combination of Tochio and Berhane discloses a control apparatus of an optical signal exchanger according to claim 1, wherein said resonance component removing section is shared by respective pairs of driving electrodes arranged in a first respective axial direction, of all tilt mirrors on said first and second mirror arrays, and by

respective pairs of driving electrodes arranged in a second respective axial direction different from said first axial direction (Tochio: fig. 19 and Berhane: paragraphs 0006, and 0035-0039, as applicable in the combination).

Regarding claim 10, the combination of Tochio and Berhane discloses a control apparatus of an optical signal exchanger according to claim 1, wherein said resonance component removing section eliminates any component included in the control signal within a bandwidth corresponding to a variation in the frequency of the mechanical resonance (Berhane: paragraphs 0006 and 0035-0039, as applicable in the combination, where the resonance eliminating effect of the Berhane-type filter makes it effectively a notch filter or band-elimination filter).

Regarding claim 11, the combination of Tochio and Berhane discloses a control apparatus of an optical signal exchanger according to claim 10, wherein said resonance component remove section comprises a circuit in which a plurality of band-elimination filters having a same characteristic are serially connected (Berhane: paragraphs 0035-0039, as applicable in the combination).

Regarding claims 12, 13 and 14, the combination of Tochio and Berhane discloses a control apparatus of an optical signal exchanger according to claim 1, wherein said resonance component removing section removes the frequency component corresponding to the mechanical resonance action included in said control signal, and discloses using a band-elimination filter (Berhane: paragraphs 0006 and 0035-0039, as applicable in the combination, where the resonance eliminating effect of the Berhane-type filter makes it effectively a notch filter or band-elimination filter), but does not specifically disclose using a band-elimination filter of Butterworth, Chebyshev or elliptic type. The office takes official notice that Butterworth, Chebyshev or elliptic based filter designs are well known in the art for achieving notch filters.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use Butterworth, Chebyshev or elliptic based filter designs as an engineering design choice in implementing the notch filter already disclosed by Berhane. The type of filter design claimed merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claim 21, Tochio discloses a control method of an optical signal exchanger which includes a first mirror array and a second mirror array, each having a plurality of tilt mirrors arranged on a plane, each tilt mirror having a reflecting surface at an angle which is controllable, an input optical signal being sequentially reflected by said first and second mirror arrays to output at a specific position (fig. 18 and paragraphs 0135-0137), at which power of an optical signal output at said specific position is detected, and feedback to control the angle of at least one of the reflecting surfaces of the tilt mirrors of said first and second mirror array, which have reflected the input optical signal on said first and second mirror arrays (fig. 19 and paragraphs 0138-148). Tochio's method is based on MEMS, but Tochio does not disclose removing a frequency component corresponding to a mechanical resonance action, included in a control signal used for said feedback control, which is commonly removed for at least a pair of driving electrodes arranged in a coaxial direction of said tilt mirror. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teaching of Berhane with Tochio as described above for claim 1.

Regarding claim 22, Tochio discloses a control apparatus of an optical signal exchanger which includes a first mirror array and a second mirror array, each having a plurality of mirrors arranged on a plane, each tilt mirror having a reflecting surface at an angle, and first and second mirror arrays sequentially reflecting an input optical signal to output at a specific position (fig. 18 and paragraphs 0135-0137), where power of an output optical signal, and the angle of at

least one of the reflecting surfaces of the tilt mirrors that reflected the input signal, being feedback controlled based on a detection result, by providing a feedback control signal to one of a pair of driving electrodes that change the angle of the at least one of the reflecting surfaces of the tilt mirrors (fig. 19 and paragraphs 0138-148). Tochio does not disclose that the control apparatus comprises a resonance component removing section that removes a frequency component corresponding to a mechanical resonance from the feedback control signal, provided to any one of the pair of driving electrodes arranged in a coaxial direction of said tilt mirror. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teaching of Berhane with Tochio as described above for claim 1.

Allowable Subject Matter

6. Claims 4-7 and 15-18 are objected to as described above and/or being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. Claims 19 and 20 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, at the objections, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Response to Arguments

8. Applicant's arguments filed 25 September 2007 have been fully considered but they are not persuasive.

The applicant argues that the date of invention of the present application is 22 August 2002, and that Tochio is prior art under 35 USC § 102(e) assigned to same assigned as the

present application, and that Tochio does not qualify as prior art because of the exclusion under 35 USC § 103(c)(1). However, 35 USC § 103(c)(1) says:

> Subject matter developed by another person, which qualifies as prior art **only** under one or more of subsections (e), (f), and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the claimed invention was made, owned by the same person or subject to an obligation of assignment to the same person. [emphasis added]

However, Tochio does **not** qualify **only** as prior art under 35 USC § 102(e). Tochio qualifies as prior art under 35 USC § **102(b)** since the publication date is more than 1 year before the actual filing date in this country of the present application (see MPEP § 201.13 and § 2133.02). Therefore, the exclusion under 35 USC § 103(c)(1) does not apply to Tochio.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

10. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pairdirect.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JASON CHAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600